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CHANGES IN MORPHOPHYSIOLOGICAL PROPERTIES IN INDICATOR PLANTS UNDER THE INFLUENCE OF POTATO VIRUS X

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Abstract
This article presents the results of a study on the determination of the peroxidase enzyme weakly bound to the cell membrane and soluble form in Datura stramonium L. plants mechanically inoculated with PTV. Soluble peroxidase produced 46.92±0.49* in the leaves of infected plants in the 1st week, 82.07±0.43 in healthy leaves, and peroxidase weakly bound to the cell membrane produced 46.88±0.46 in healthy leaves, 88.8±0.34* in infected leaves, and other values are fully reflected in the article. At the same time, the results of the dynamics of changes in enzyme activity under the influence of viruses over 3 weeks are described, and this indicator was determined every week.

Keywords: Datura stramonium L., KXV, peroxidase weakly bound to the cell membrane, soluble peroxidase, mosaic.

KARTOSHKA X VIRUSI TA'SIRIDA INDIKATOR O'SIMLIKLARDA MORFOFIZIOLOGIK XUSUSIYATNING O'ZGARISHI.

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Annotatsiya
Ushbu maqolada KXV bilan mexanik inokulyatsiya qilingan Datura stramonium L. o'simligidagi peroksidaza fermentining hujayra membranasi bilan kuchsiz bog'langan va eruvchan turini aniqlash ustida olingan tadqiqot natijalari haqida ma'lumotlar berilgan. Eruvchan peroksidaza 1-haftada kasallangan o'simlik barglarida 46,92±0,49*, sog'lom barglarda 82,07±0,43, hujayra membranasi bilan kuchsiz bog'langan peroksidaza esa sog'lom barglarda 46,88±0,46, kasallangan barglarda 88,8±0,34*ni hosil qilganligi va boshqa qiymatlar maqolada to'liq aks ettirilgan. Shu bilan birga ferment aktiligining viruslar ta'sirida 3 hafta mobaynida o'zgarish dinamikasi natijalari bayon qilingan bo'lib, bu ko'rsatgich har bir haftada aniqlab borilgan.

Kalit so'zlar: Datura stramonium L., KXV, hujayra membranasi bilan kuchsiz bog'langan peroksidaza, eruvchan peroksidaza, mozaika.

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Introduction

The problem of maintaining human health and food security is one of the most serious problems facing humanity since ancient times. Considering that the world's population has exceeded 8 billion, and the number of people suffering from hunger has approached 9 million [16], it is impossible not to recognize that the way to solve such problems is to increase nutritious crops, prevent, find the cause and combat factors that damage agricultural plants. It should be recognized that potatoes are one of the most widespread crops in the world as food, technical and fodder crops. In world agriculture, they occupy fifth place in terms of area sown after wheat, rice, corn and sorghum, and fourth place in terms of gross production. Today, more than 40% of potato production falls on China, Russia and India [6]. Due to its biological properties, potatoes are more susceptible to viral diseases than other crops, and the key to achieving higher yields is to combat these diseases. Up to 52 viruses have been identified to infect potato plants, and potato virus X (PXV) has been studied by a number of authors in Uzbekistan [10]. The authors examined wild and cultivated plants in and around potato growing areas and found that they were infected with PXV and that this virus was transmitted to other plants through mechanical, soil, and plant sap (tlya) means [3,4,5,10,12]. Since the mechanism of action of viruses is intracellular, they affect not only the occurrence of physiological and biochemical processes in plants, but also changes in their pigments and enzymes, protein content, and cold resistance [14,15]. The peroxidase enzyme also plays a special role in the defense mechanism of plants, and peroxidase is characterized by the transfer of hydrogen from substrate molecules to peroxides due to the oxidation-reduction reaction [1]. An increase in the systemic activity of the peroxidase enzyme as a result of the disease was carried out in tobacco highly resistant to tobacco mosaic virus (TMV), revealing signs of systemic resistance of the plant immune system [10].

As can be seen from the Decree of the President of the Republic of Uzbekistan No. PF-6262 dated July 15, 2021 “On measures to radically improve the system of plant quarantine and protection in the Republic”, it is important to determine the level of impact of viruses on plants to combat pathogens that occur in plants. Therefore, the main goal of this work was to study the dynamics of the peroxidase enzyme in Datura stramonium L. mechanically inoculated with KVV.

Experience part. The disease symptoms of KXV appear at different times in different plants[10]. In our experiment, Datura stramonium L., the disease symptoms appeared after 20-22 days (pictured).

Fig. Disease-specific symptoms of CWD in D.stramonium L. plant.
a. – healthy D.stramonium L. plant. b. - Disease-specific symptoms of CWD.

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Therefore, in our study, the dynamics of enzyme changes in Datura stramonium L. plants under the influence of KXV were determined for 3 weeks. For this, healthy plants were selected and infected with KXV using mechanical inoculation [3,4]. The systemic activity of the peroxidase enzyme in plants was studied 1 week after infection. The peroxidase enzyme is found in plant cells in a weakly bound to the cell membrane and in a soluble form [9]. The dynamics of enzyme activity was studied for each species. 3-4 leaves of virus-infected plants were selected for the experiment. When measuring enzyme activity, volumes were selected according to the Boyarkin method [2] and determined in a spectrophotometer (METASH-5100) at a wavelength of 670 nm (absorbance of benzidine (4,4'-diaminodiphenyl)) [10]. A healthy plant leaf was used as a control. Based on the results obtained, the peroxidase enzyme activity was calculated using the following formula:
Analysis of the results obtained and conclusion. The experimental results were calculated and presented in the form of a table and diagram (table).

Table **Enzyme dynamics in Datura stramonium L.**

Sample / Control dynamics	n	Datura tatula			
		Peroxidase activity U/ml			
		Weakly bound to the cell membrane		Soluble peroxidase	
		Control	Diseased leaf	Control	Diseased leaf
1- week	4	46,88±0,46	88,8±0,34*	82,07±0,43	46,92±0,49*
2- week	4	55,99±0,57	91,12±0,12*	52,43±0,22	47,99±0,55*
3- week	4	36,32±0,17	23,72±0,04	48,66±0,08	42,04±0,07

*- control - a leaf from a healthy plant. *P<0,05, n=4

The results showed that when enzyme activity was examined 1 week after the virus infection of Datura stramonium L. plants, HMBKB peroxidase was 88.8±0.34*, while in healthy plants it was 46.88±0.46, and soluble peroxidase was 46.92±0.49* in infected plants and 82.07±0.43 in healthy plants. This indicator increased to 36.32±0.17 in infected leaves and 23.72±0.04 in healthy leaves by week 3, while soluble peroxidase was 42.04±0.07 in infected leaves and 48.66±0.08 in healthy leaves. The results of the experiment obtained in the 2nd week are presented in the table above
When the results of the experiment are also expressed in a graphical form, we can see that the peroxidase weakly bound to the cell membrane was higher in infected plants compared to the control in the 1st-2nd week, and decreased in the 3rd week, and the soluble peroxidase showed a lower activity every three weeks. It is known from this that in the first days of virus infection, the activity of HMBKB peroxidase was much higher than in the control, and its decrease in the 3rd week was inversely proportional to the virus concentration. The experiment conducted is the beginning of our research, and it is necessary to continue the research for a longer period, to study other enzymes and similar compounds involved in the immune system of plants in addition to peroxidase. The deeper and wider conduct of such experiments will allow us to use them in a certain sense in developing measures to combat phytopathogenic viruses, and in the treatment of plants using biochemical methods.

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